always be looked upon as of secondary importance, we are convinced that greater progress will be made if chemistry is regarded and studied from the high point of view so forcibly pointed out by Dr. Fittig in his interesting address. F. J.

LETTERS TO THE EDITOR

[*The Editor does not hold himself responsible for opinions expressed by his Correspondents. No notice is taken of anonymous communications.*]

Chemical Research in England

In confirmation of your remark in the last number of Nature that, in regard to scientific discovery, we in this country "are conspicuous for our prominent position in the rear," will you permit me to state the result of an inquiry which I lately made into the comparative activity of this and other countries in the prosecution of chemical research?

In the year 1866 there were published 1,273 papers on new discoveries, by 805 chemists, 1·58 paper being thus the average produce of each investigator. Of these, Germany contributed 445 authors and 777 papers, or 1·75 paper to each author; France, 170 authors, and 245 papers, or 1·44 paper to each author; whilst the United Kingdom furnished only 97 authors, and 127 papers, or 1·31 paper to each author; all other countries yielding 93 authors and 124 papers, or 1·33 paper to each author. Thus, not only are we far behind in the aggregate of activity in discovery, but our individual productiveness is also markedly below that of Germany and France. From a purely national point of view, our case is even worse than it appears to be from a comparison of these figures, since a considerable proportion of the papers contributed by the United Kingdom were the work of chemists born and educated in Germany.

It will be seen that the above comparison covers chemistry only; but there is every reason to believe that in other sciences, the progress of which depends, like that of chemistry, upon experimental investigation, our position is still worse. It is highly remarkable that a country which, perhaps more than any other, owes its greatness to the discoveries of experimental science, should be distinguished for its neglect of experimental research. But the causes of this anomaly are sufficiently obvious; they are:

1st. The want of suitable buildings and apparatus for the prosecution of such investigations.

2nd. The non-recognition of experimental research by any of our universities.

With regard to the first of these causes, the prosecution of experimental discovery in this country is rendered extremely difficult, if not impossible, to those who do not possess ample private fortunes; and even to such as have this advantage, it is by no means easy. A laboratory of research is not a convenient or agreeable adjunct to a dwelling-house, and it is generally prohibited by the terms of the lease or covenant; indeed it is agreed on all hands that most of the operations which are required for the prosecution of inquiries in chemistry, physics, and physiology, ought only to be carried on in buildings specially devoted to the purpose. But where are such buildings to be found? Our chemical laboratories are only adapted for beginners, there is not in any one of them a separate department constructed and fitted for original research. Still less is this the case in physical and physiological laboratories; indeed until Sir William Thomson instituted one in Glasgow some three or four years ago, there was not in the United Kingdom a physical laboratory even for beginners. In Germany, on the other hand, the noble State laboratories of Berlin, Leipzig, Bonn, Heidelberg, Königsberg, and Stuttgart, are provided with special departments where the experimental investigator finds ample convenience and the necessary but costly instruments of precision provided for his use, the payment of a moderate fee only being required to secure all these advantages.

With regard to the second case, the highest degrees, and even honours in experimental science, are given in all our universities without any proof being required that the candidate possesses the capacity to conduct an original experimental investigation, or that he is competent to extend the boundaries of his science. On the other hand, in all the Prussian Universities, and in the best German Universities generally, no candidate is even admitted to examination for his degree unless he first submits to the senate a dissertation on some original experimental investigation conducted by himself. This investigation must also have a sufficient importance; for, as a matter of fact, more candidates are rejected on the ground of insufficiency of dissertation than through failure to pass the subsequent examinations. The entire ignoring of research in the granting of degrees in this country not only effectually prevents the training of students in experimental investigation, and the actual execution of researches by students; but it has also a direct tendency to divert the attention of professors and teachers from original research—they are not called upon to devise, as is the case in Germany, suitable subjects for research to be pursued by their students; and thus, not only is their attention withdrawn from this all-important field of experimental science, but, as their students have to be trained for subjects which are foreign to research, they feel that to devote any considerable portion of their own time to it would be to that extent to neglect their class duties.

E. Frankland

Dublin Observatory

In an account of the Observatory of Trinity College, Dublin, given in Nature of March 16, 1871, there is a slight mistake in the date of the erection of the Transit Instrument, which is there assigned to 1808. It was erected many years before; for in the second volume of the Transactions of the Royal Irish Academy, Dr. Usher describes observations made with it in 1785.

I should not have thought the correction of this error necessary but for the fact that this transit marked the epoch of a most important improvement in astronomical instruments. It was the first in which the illumination of wires was effected through the axis by an internal reflector. This invention is described by Usher in the volume already referred to.

1808 was the date of the circle's erection; it having been ordered in 1783. This delay was in one respect fortunate. Ramsden, having quarrelled with Usher, resolved that the latter should never have the circle. On Usher's death Ramsden set to work to complete it, but found, to his dismay, that the extremities of its radial arms had become "rotten," having been acted on by the sulphurous atmosphere of London.

As originally constructed, it was ten feet diameter. He removed the rims (which, I believe, had been also acted on), cut away about six inches from each of the arms, and found the remainder sound. But as he was doubtful about its permanence, he let it lie several years longer, and found his apprehensions verified. He cut off six inches more from each arm and awaited the result, notwithstanding the urgent expostulations of Brinkley; and it was not until a short period before his death that he was satisfied that no farther change was probable. He then completed it at its reduced diameter of eight feet. But it was not divided till after his death (by Berge, his successor).

It is not easy to explain why this destruction was confined to the ends of the arms. To judge from the analogy of the Palermo Circle, the diameter of these arms at the outer extremity was very small; and if they were of cast brass, the molecular condition of the metal there, in consequence of the more rapid cooling, may have been different from that of the more massive portions.

A still more remarkable instance of this destructive action occurred to a circle described by Mr. Bond in the Philosophical Transactions, 1806, and known as the Westbury Circle. This was ultimately established at the old Observatory of the Glasgow University, and in an atmosphere still more sulphurous than that of London. When this University was broken up, and its instruments sold, this circle was purchased by the late Sir James

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South. But on its arrival at his Observatory it was found to have suffered so much that it actually fell to pieces! Only a few of the more massive parts were entire; and of the rims of the circle nothing remained except that which carried the divisions, which, as I was informed by Troughton, was of "Dutch brass," and was quite unchanged.

The excellence of this Dutch brass is, I believe, recognised also by watchmakers, and it seems to deserve inquiry to what its superiority over English brass is to be attributed.

It is worthy to be mentioned that among the instruments ordered from Ramsden by Usher was an equatorial telescope driven by clockwork. But owing to Ramsden's feud with Usher, this was not executed; and this important aid to the astronomer, which had been proposed by Hook nearly a century before, lay dormant till it was applied by Frauenhofer, forty years later, to the Dorpat telescope. T. R. R.

Armagh

Morell's Geometry

IN answer to your criticisms on my work, "The Essentials of Geometry," I have given an explanation as to the sources of that book. I proceed to give very briefly my arguments for what is there advanced.

I shall do so under two heads, which will be in the form of indictments against my reviewer.

For I charge him, first, with overlooking the nature and object of the book; and, secondly, with overlooking the context of passages he criticises, an omission that changes the entire aspect of the case.

First it is explained (Preface, p. vii.) that my little volume is an attempt at a manual and memento for students, of which so many exist in France and Germany It is notorious that such works do not dispense with others, or touch the plan of school text-books, and then much of their contents consists of results with hints of demonstrations. Then at p. viii. of Preface it is added that an inspection of the methods employed will show that German and French geometricians . . do not condemn the student to keep a geometrical figure rigidly in the place in which it is laid down on paper. Revolution and superposition are allowed . . . simplifying and shortening the proof, &c.

Passing to the second indictment, I find that the criticism levelled against my so-called theorems of parallels commits two serious offences. First, it garbles my matter; secondly, it overlooks the principles first laid down in the preface, applying from logic two propositions treated by me both manually and logically; thirdly, it overlooks claims in pp. 15, 24, 25, where the technical terms in p. 20 are explained; lastly, it ignores the fact that all our theorems about parallels rest on assumptions and not on logic.

It is evident that if superposition be allowed, two parallels as they cannot cut (hyp.) must coincide, thus the angles they form with a secant will be equal.

Again, the charge of want of logic in my proof of the inequality of triangles with three equal sides falls to the ground, if the first clause of p. 44 be read. For as this is a case of superposition by making the bases coincide, the arms of both triangles must coincide as radii of equal length intersecting at only one point on the same side of the base. The proof is equally direct from symmetry, from inversion and juxtaposition, and from subposition, as in the Notes to Todhunter's School Euclid.

As to the critic's difficulties about explaining the coincidence of two semicircles, to any one used to the free handling of geometrical figures in France and Germany, the thing wears a ludicrous aspect.

Then about the statement that two equal adjacent dihedral angles are right angles, a moment's reflection shows that if a dihedral angle be defined (Bos. p. 32) as an angle formed by the revolution of a movable plane at its common section over a stationary plane, when it reaches the point where the two adjacent angles are equal, they must be right angles. The definition may be disputed, but the conclusion is correct.

As regards the criticisms on my definitions, I do not think it necessary to enter into this matter. The ground of definitions is a wide and a disputed one, and I am content to err, if err I do, with very high authorities. Euclid has defined a straight line to be that which lies evenly or equally between its extreme points. This definition affords no assistance in arriving at the properties of straight lines. In Dr. Simson's edition, a point is defined to be that which has no parts or no magnitude. This is objectionable, as being wholly negative. Again Dr. Simson, in the notes to his edition of Euclid, admits that the 11th axiom is not self-evident.

In conclusion, the reviewer is of course as likely to attack the free treatment of theorems and problems practised, especially in Germany, by the conception of the generation of all figures from their elements by the movement of points and lines. But it can scarcely be charged against the author of the "Essentials" that he has not shown some of these shorter methods of demonstration as used in France and Germany.

The nature of revolution is fully illustrated at pp. 6, 8, and the treatment of angles as ratios in note 2, p. 9. Our limits prevented anything more than indications, but *verbum sat.* to the great logicians of England. J. R. MORELL

On the Derivation of the name "Britain"

HAVING been from home, I did not see the letter of "A. H." in your publication of March 16 until yesterday. His only objection to my derivation of the name *Britain* is that the word *tin* in his opinion was "not used in this island so early as the argument for its forming part of the word *Britain* requires. The following remarks will show that it *must* have been used in this island quite as early as the word *Britain*.

His assertion that "our word *tin* is of comparatively modern formation," cannot be established. It *must* have been familiar to the Cornish centuries before Diodorus Siculus described St. Michael's Mount, in Cornwall, under its name of *Iktin*, from whence tin was exported by the Phœnicians as far back as the time of Moses (Numb. xxxi. 22); and from none but the Phœnicians could the Cornish have derived the word *tin*—for that metal, as well as its name, was unknown to them before they were visited by the Phœnicians. The name *Iktin* (Tin-port) by which the Mount was called in the time of Diodorus, proves the existence of the word *tin* prior to that period, and the present Cornish word *stean* can only be a corruption of the very anciently adopted word *tin*—a corruption arising probably during the Roman period, so that instead of *tin* being a corruption of the Welsh *ystaen*, or of the Latin *stannum*, as "A. H." imagines, the reverse is evidently the case.

Assuming, with most authors, the original Phœnician word to be *tin*, that name continues unchanged in the Saxon, English, Dutch, Danish, and Icelandic languages; but the Swedish name is now *tinn;* the German, *zinn;* the French, *étain* and *tain;* the Latin, *stannum;* the Italian, *stagno;* the Spanish *estano;* the Portuguese, *estanho;* the Irish, *stan;* the Welsh, *ystaen;* the Cornish, *stean;* the Armoric, *stean* and also *staen*—the initial letter or sound *s* in each of the last nine names being a mere prefix, as in the modern word *sneeze* for *neeze* (Job xli. 18). With this exception, and except the ordinary terminations of the Latin, Italian, Spanish, and Portuguese names, these thirteen different spellings are merely the different ways in which different nations of Europe pronounce the Phœnician word *tin*.

Diodorus speaks of *Iktin* as an island adjoining *Britain;* and this island (for it *is* an island two-thirds of the day) was no doubt long before his time called sometimes *Iktin* and sometimes *Bretin;*—*Iktin* when it was regarded as a "port," and *Bretin* when regarded as a "mount"—*ik* being the Cornish for "port," and *bre* the Cornish for "mount." It was however most generally known as a mount, and as the most remarkable object in *Mount's* Bay, to which it has therefore given its *English* name, having long before the Christian era, in all probability, given its ancient Cornish name of *Bretin* to the island in which we live.

Plymouth, March 29 RICHARD EDMONDS

Records of European Research

THE Chemical Society has taken up a good cause, that of reporting foreign labours much more fully than could be worth the while for any periodical publication to undertake.

I have suggested in another quarter the advisability, if possible, of joining in this scheme. But funds are requisite to have the work well done.

It has struck me that, as a matter of completeness and economy, it would be far better if the learned societies subscribed, and the Royal Society made a grant besides its subscription, to engage an efficient staff to report foreign contributions not merely to one branch of science, but to all, forming, let us say, a quarterly *comptes rendus* of European research.

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